



Union of Concerned Scientists

Citizens and Scientists for Environmental Solutions

Testimony before the Senate Subcommittee on Clean Air, Climate Change and Nuclear Safety

On behalf of the Union of Concerned Scientists (UCS), it is my pleasure to appear before this Subcommittee. My name is David Lochbaum. After obtaining a degree in nuclear engineering from The University of Tennessee in 1979, I spent more than 17 years in the nuclear industry, mostly at operating power reactors in Georgia, Alabama, Mississippi, Kansas, New Jersey, Pennsylvania, New York, Ohio, and Connecticut, before joining UCS in October 1996 as their nuclear safety engineer. UCS, established in 1969 as a non-profit, public interest group, seeks to ensure that people have clean air, energy and transportation, as well as food that are produced in a safe and sustainable manner. UCS has monitored nuclear plant safety issues for over 30 years.

LESSONS FROM THE PAST

Twenty five years ago this past March, the Three Mile Island Unit 2 reactor outside Harrisburg, Pennsylvania experienced the worst nuclear plant accident in U.S. history. The 25th anniversary of that meltdown got considerable media attention. One reporter asked me how the nuclear industry would be different today had the Three Mile Island accident not happened. “There would be no difference,” I answered him, “because that accident was bound to happen – if not at Three Mile Island, then at some other reactor.” One-of-a-kind design flaws, isolated operator training deficiencies, or unique equipment failures did not cause the accident. Degraded conditions prevalent at and tolerated on all reactor sites ultimately produced a meltdown at one site – Three Mile Island. The many post-mortem inquiries into that accident resulted in extensive changes in the organization and management of the nuclear industry and its regulator, the Nuclear Regulatory Commission (NRC).

This history is relevant to today’s hearing because compelling evidence suggests that extensive, degraded conditions at reactor sites are once again being tolerated. The NRC’s response to these warning signs have amounted to little more than rearranging the deck chairs on the *Titanic*. Fortunately, there is still time for the NRC to plot a different course so as to avoid the icebergs looming on the horizon.

WARNING SIGNS IN THE PRESENT

The Davis-Besse nuclear plant in Ohio recently restarted after being shut down more than two years for repairs to emergency equipment. The NRC concluded that deteriorating conditions at Davis-Besse had, over a period of nearly six years, reduced safety margins to the point where the reactor was within two to thirteen months of having an accident like Three Mile Island. The NRC identified more than four-dozen flaws in its regulatory oversight processes that allowed Davis-Besse to flirt with disaster. Many of those regulatory flaws remain uncorrected and are not even scheduled for correction.

Davis-Besse is not an isolated case. It is the twenty-eighth (28th) nuclear power reactor to be shut down for a year or longer for safety repairs since September 1984. In fact, there has not been a single minute in the past two decades without at least one reactor mired in a year-plus outage.

A year-plus outage adversely affects the reliability of the electrical power grid. It adversely affects the costs paid by ratepayers for electricity and the returns received by stockholders. It adversely affects safety levels exposing workers and the public to undue hazards. Twenty-eight year-plus outages in twenty years is an extremely poor report card for both the nuclear industry and its regulator. Nuclear safety problems must be found and fixed before they grow to epidemic proportions.

The NRC's report cards from internal and external auditors are equally bad, especially since so many of yesterday's problems still factor into today's problems. Very little is getting fixed. A review of reports issued by NRC Lessons Learned Task Forces, the NRC Office of the Inspector General (OIG), and the U.S. General Accounting Office (GAO) over the past eight years shows the same regulatory problems contributing again and again to unacceptable safety levels. Examples of these recurring, uncorrected findings are:

Auditor – Date	Verbatim Auditor Findings & UCS Comments
US NRC OIG – 10/2003 ¹	<p><i>“OIG found that NRC Headquarters did not integrate the issues raised in Generic Letters 88-05 and 97-01 into NRC’s inspection program.”</i></p> <p>UCS Comment: NRC Headquarters issued the generic letters to require owners to take steps to avoid safety problems encountered at other nuclear plants, but failed to follow-up to verify that the owners actually took those steps.</p>
	<p><i>“OIG determined that there was ineffective communication among [NRC] Region III managers concerning boric acid leakage and corrosion at Davis-Besse.”</i></p>
	<p><i>“OIG determined that the [NRC] Senior Resident Inspector, Resident Inspector, and possibly the ISI Inspector reviewed Davis-Besse CR 2000-0782 [containing the infamous Red Photo] during 12 RFO [the 12th refueling outage, April 2000]. These inspectors did not recognize the significance of the boric acid corrosion described in CR 2000-0782.”</i></p> <p>UCS Comment: In 1999, the NRC sanctioned Davis-Besse’s owner for a safety problem caused by boric acid corrosion, but that lesson was soon forgotten by the owner and the NRC.</p>
US GAO – 09/2003 ²	<p><i>“NRC’s Inspection Practices Minimize the Significance of Some Security Problems”</i></p>
	<p><i>“NRC Does Not Systematically Collect, Analyze, and Disseminate Information That May Improve Security at All Plants”</i></p> <p>UCS Comment: A major contributor to the 1979 meltdown at Three Mile Island was NRC’s failure to disseminate known safety problems to plant owners. The NRC developed a system for sharing safety information, but did not – even in the wake of 09/11 – extend this system to cover security problems.</p>
	<p><i>“NRC’s Force-on-Force Exercises Are Limited in Their Usefulness”</i></p>
	<p><i>“[Security force-on-force] Exercises Did Not Test the Full Extent of the Design Basis Threat”</i></p> <p>UCS Comment: The NRC’s Design Basis Threat is not established at such a lofty level that testing shy of it is justified.</p>

¹ U.S. Nuclear Regulatory Commission Office of the Inspector General, Case No. 03-02S, “NRC’s Oversight of Davis-Besse Boric Acid Leakage and Corrosion During the April 2000 Refueling Outage,” October 17, 2003.

² U.S. General Accounting Office, GAO-03-752, “Nuclear Regulatory Commission: Oversight of Security at Commercial Nuclear Power Plants Needs to Be Strengthened,” September 2003.

Auditor – Date	Verbatim Auditor Findings & UCS Comments
US NRC OIG – 05/2003 ³	<p><i>“NRC performs limited inspections of licensees’ MC&A [materials control and accountability] activities, and cannot assure the reliability of the SNM [special nuclear material] tracking system.”</i></p> <p>UCS Comment: The SNM tracking system is one of the barriers against “dirty bombs.” This barrier must be as effective as possible.</p>
US NRC OIG – 12/2002 ⁴	<p><i>“NRR [NRC’s Office of Nuclear Reactor Regulation] staff described to the technical assistants [of the Commissioners] ...how NRR’s decision to allow Davis-Besse to operate ... comported with the five safety principles outlined in the NRC’s risk-informed decisionmaking guidelines. NRR staff noted that although four out of five safety principles were not explicitly met, the staff concluded that Davis-Besse could operate safely until February 16, 2002.”</i></p> <p>UCS Comment: 20% <u>cannot</u> be a passing grade when it comes to nuclear plant safety. NRC must abide by its safety principles, not generate excuses for ignoring them.</p>
	<p><i>“An NRR manager stated that from the perspective of external stakeholders, the need for a shutdown order is not a positive indicator for the nuclear industry and would destabilize confidence in the nuclear industry’s ability to make the right decisions.”</i></p> <p>UCS Comment: The NRC’s poor performance at Davis-Besse destabilized confidence in its ability to make the right decisions. The NRC must worry more about safety and less about the nuclear industry’s public relations.</p>
US NRC OIG – 12/2002 ⁵	<p><i>“Less than half (48%) of NRC employees feel that management actually trusts the judgment of employees at their level in the organization.”</i></p>
	<p><i>“Slightly more than half (53%) of the employees feel that it is “safe to speak up in the NRC.””</i></p> <p>UCS Comment: It is simply unacceptable for half of the NRC work force to fear speaking up. The NRC would not tolerate such a large ‘fear factor’ at nuclear plant sites and must not tolerate such a condition internally.</p>
	<p><i>“In comparison with 1998 survey data, the only item that shows a significant decrease (-5 percentage points) in favorability is “I believe NRC’s commitment to public safety is apparent in what we do on a day-to-day basis.””</i></p>

³ U.S. Nuclear Regulatory Commission Office of the Inspector General, OIG-03-A-15, “Audit of NRC’s Regulatory Oversight of Special Nuclear Materials,” May 23, 2003.

⁴ U.S. Nuclear Regulatory Commission Office of the Inspector General, Case No. 02-03S, “NRC’s Regulation of Davis-Besse Regarding Damage to the Reactor Vessel Head,” December 30, 2002.

⁵ U.S. Nuclear Regulatory Commission Office of the Inspector General, OIG-03-A-03, “2002 Survey of the NRC’s Safety Culture and Climate,” November 2002.

Auditor – Date	Verbatim Auditor Findings & UCS Comments
US NRC – 09/2002 ⁶	<p><i>“The NRC failed to integrate known or available information into its assessments of DBNPS’s [Davis-Besse Nuclear Power Station’s] safety performance.”</i></p>
	<p>UCS Comment: Like NASA’s failure to properly evaluate available information on the insulation striking the Columbia’s wing during launch, NRC failed to properly evaluate available information about Davis-Besse.</p>
	<p><i>“The NRC failed to adequately review, assess, and followup on relevant operating experience to bring about the necessary industry and plant specific actions to prevent this event.”</i></p>
	<p><i>“The NRC accepted industry positions regarding the nature and significance of VHP nozzle cracking without having independently verified a number of key assumptions, including the implementation effectiveness of boric acid corrosion control programs and enhanced visual inspections of RPV [reactor pressure vessel] heads.”</i></p> <p><i>“During the period in which the symptoms and indications of RCS [reactor coolant system] leakage were visible, the managers and staff members of the NRC’s regional office responsible for DBNPS oversight were more focused on other plants that were the subject of increased regulatory oversight. This distracted management attention and contributed to staffing and resource challenges impacting the regulatory oversight of DBNPS.”</i></p> <p>UCS Comment: During this very same time period, the NRC did not permit ‘distractions’ from keeping the agency from meeting scheduler goals for license renewal and power uprate approvals. The NRC had sufficient resources but applied them with poor safety focus. This lack of proper focus must be remedied as soon as possible.</p>
US NRC OIG – 08/2002 ⁷	<p><i>“The agency has not developed guidance for an independent verification process to provide assurance that licensee risk assessment results are acceptable for SDP [significance determination process] purposes and provide a sound basis for regulatory decisions.”</i></p>
	<p><i>“Senior NRC officials confirmed that the agency is highly reliant on information from licensee risk assessments. Agency officials also noted that there are no PRA [probabilistic risk assessment] standards, no requirements for licensees’ PRAs to be updated or accurate, and that the quality of the assessments varies considerably among licensee.”</i></p> <p>UCS Comment: “Garbage in, garbage out” is imprudent regulatory practice and must cease. The NRC must either establish minimum standards or stop relying on obsolete, inaccurate information.</p>

⁶ U.S. Nuclear Regulatory Commission Lessons Learned Task Force, “Degradation of the Davis-Besse Nuclear Power Station Reactor Pressure Vessel Head Lessons-Learned Report,” September 2002.

⁷ U.S. Nuclear Regulatory Commission Office of the Inspector General, OIG-02-A-15, “Review of NRC’s Significance Determination Process,” August 21, 2002.

Auditor – Date	Verbatim Auditor Findings & UCS Comments
US NRC OIG – 08/2000 ⁸	<p><i>“OIG learned that, although historically Region I has provided IP2 with enhanced oversight, the Region did not focus specifically on the plant’s steam generators. According to the Region I Administrator, the Region did not view steam generators as significant in the overall oversight and regulation of IP2.”</i></p> <p>UCS Comment: Indian Point Unit 2 (IP2) had the oldest steam generators of this type still in service. All other steam generators of this vintage had been replaced due to safety problems. The NRC had no credible reason for excluding the steam generators from its oversight at Indian Point Unit 2.</p>
	<p><i>“OIG noted that in July 1997, the same month that the IP2 steam generator inspector report was received by NRR, the NRC Office of Public Affairs issued “NRC Technical Issues Papers and Fact Sheets: Steam Generator Tube Issues” ...:</i></p> <p><i>These [steam generator] tubes play an important safety role because they stand between the radioactive and nonnuclear sides of the plant. The integrity of the tubing is instrumental in minimizing leakage of water between the two sides. There is the potential that if reactor fuel is damaged and several tubes were to burst at once, it could lead to a fairly significant release of radioactive steam.”</i></p>
	<p><i>“OIG learned that neither the Region I nor NRR staff conducted a technical review of IP2’s 1997 steam generator tube inservice inspection report when it was submitted in July 1997.”</i></p>
	<p><i>“The [NRC] junior engineer [reviewing IP2’s request to defer steam generator inspections] added that she had concerns regarding the steam generators crack growth rates that were not addressed in the original license amendment submittal. ... OIG learned that the junior engineer did not ask additional questions of the licensee, although she believed the responses to the RAI [NRC’s request for additional information] could have been more robust. The junior engineer stated that a second request of questions was “frowned upon” by NRR management. ... The junior engineer stated “I felt like we were stuck” with the IP2 responses to the RAI.”</i></p> <p>UCS Comment: The NRC demands that its licensees encourage “questioning attitudes” by plant workers, yet places impediments to its own staff asking questions about safety levels. These impediments must be eliminated.</p>
	<p><i>“NRC Has Not Resolved Many Issues Needed to Implement a Risk-Informed Regulatory Approach”</i></p> <p><i>“Utilities Do Not Have Accurate and Reliable Design Information for Some Plants”</i></p>

⁸ U.S. Nuclear Regulatory Commission Office of the Inspector General, Case No. 00-03S, “NRC’s Response to the February 15, 2000, Steam Generator Tube Rupture at Indian Point Unit 2 Power Plant,” August 29, 2000.

⁹ U.S. General Accounting Office, Testimony before the Subcommittee on Clean Air, Wetlands, Private Property, and Nuclear Safety, Committee on Environment and Public Works, U.S. Senate, GAO/T-RCED-99-71, “Nuclear Regulatory Commission: Strategy Needed to Develop a Risk-Informed Safety Approach,” February 2, 1999.

Auditor – Date	Verbatim Auditor Findings & UCS Comments
US GAO – 02/1999 ⁹	<i>“NRC Does Not Have Confidence That Safety Analysis Reports Reflect Current Plant Designs”</i>
	<i>“Erroneous Evaluations Can Erode Design and Safety Margins”</i> UCS Comment: Davis-Besse demonstrated that this problem still exists.
	<i>“NRC Does Not Have a Standard for the Content of Risk Assessments”</i>
	<i>“NRC Has Not Determined Whether Compliance With Risk-Informed Regulations Would Be Mandatory or Voluntary”</i>
US GAO – 01/1999 ¹⁰	<i>“NRC Lacks Assurance of Nuclear Plants’ Safety”</i>
	<i>“NRC Is Slow to Require Corrective Action”</i> UCS Comment: The NRC initiated Generic Safety Issue No. 191 in September 1996. It involves known deficiencies in vital safety systems at most of the nation’s power reactors that increases the likelihood of meltdown by as much as a factor of 100. The NRC’s current ‘schedule’ calls for this problem to be resolved sometime in 2007.
	<i>“NRC’s Culture and Organizational Structure Impede Effective Actions”</i>
	<i>“NRC Does Not Precisely Define Nuclear Plant Safety”</i>
US GAO – 07/1998 ¹¹	<i>“NRC Is Not Effectively Overseeing Problem Plants”</i>
	<i>“Management Competency Is Critical to Safety”</i>
	<i>“Early Intervention Could Result in Fewer Problem Plants”</i>
	<i>“[NRC] Employees report that communicating problems results in a ‘shoot-the-messenger’ syndrome.”</i> UCS Comment: NRC management simply must not impede the free communication about nuclear safety problems.
US NRC OIG – 06/1998 ¹²	<i>“More than half of the employees (53%) say the management style at NRC does not encourage employees to give their best.”</i>
	<i>“Fifty-two percent (52%) of employees do not feel the NRC has a climate where one can challenge the traditional ways of doing things.”</i>
	<i>“NRC Is Not Effectively Overseeing the Plants That Have Problems”</i>
US GAO – 05/1997 ¹³	<i>“NRC Is Not Getting Licensees to Fix Deficiencies in a Timely Manner”</i>
	<i>“Relying on Plant Managers to Fix Problems Is Not Always Effective”</i>
	<i>“NRC Enforcement Actions Are Too Late to Be Effective”</i> UCS Comment: On May 7, 2004, the NRC announced that it was not imposing sanctions on Davis-Besse’s owner for having provided false information to the agency because, in part, the five-year statute of limitations had expired.
	<i>“The Senior Management Meeting Needs Revamping to Aid Early Intervention”</i>
	<i>“Increased Trend Analyses Could Identify Weak Areas”</i>

¹⁰ U.S. General Accounting Office, GAO/OCG-99-19, “Major Management Challenges and Program Risks: Nuclear Regulatory Commission,” January 1999.

¹¹ U.S. General Accounting Office, Testimony before the Subcommittee on Clean Air, Wetlands, Private Property, and Nuclear Safety, Committee on Environment and Public Works, U.S. Senate, GAO/T-RCED-252, “Nuclear Regulatory Commission: Preventing Problem Plants Requires More Effective Action by NRC,” July 30 1998.

¹² U.S. Nuclear Regulatory Commission Office of the Inspector General, “NRC Safety Culture and Climate Survey,” June 1998.

¹³ U.S. General Accounting Office, GAO/RCED-97-145, “Nuclear Regulation: Preventing Problem Plants Requires More Effective NRC Action,” May 1997.

Auditor – Date	Verbatim Auditor Findings & UCS Comments
US GAO – 01/1996 ¹⁴	UCS Comment: On March 28, 1999, the NRC disbanded its office for the Analysis and Evaluation of Operational Data (AEOD) which effectively conducted trend analyses.

The NRC attempted to remedy the shortcomings identified by its auditors. However, these efforts failed to achieve the necessary outcome of preventing recurrence. The NRC's current regulatory processes rated Davis-Besse in 2002 as one of the best performing reactors in the U.S. – it now appears that Davis-Besse was the worst performer. Obviously, the NRC failed to correct enough of its many shortcomings. If the agency corrected its regulatory impairments, it would be able to detect declining safety levels sooner and intervene long before year-plus outages are needed to restore the necessary safety margins.

ROADBLOCKS TO NRC REFORMS

The NRC has many talented and capable employees committed to the agency's vital mission of protecting public health and safety. But as NASA learned with the *Challenger* tragedy and re-learned with the *Columbia* tragedy, technologies where risk is dominated by high-consequence, low-probability events require much more than the commitment of talented, capable workers. They require an unrelenting, uncompromising approach to safety.

The NRC strives to provide that level of oversight, but falls short too often as demonstrated by the 28 year-plus reactor outages in the past 20 years. The agency's efforts are stymied by its hiring and promotion policies. Very few of the NRC's senior technical managers are new to the agency. The majority worked their way up through the ranks. Consequently, NRC's managers come from the same mold and have the same habits. Retirements and reorganizations at NRC merely put new faces on the same management style. Reform efforts fail because merely re-packaging and re-applying that management style cannot yield substantive changes.

The aforementioned twenty-eight reactors that endured lengthy outages shared the common trait of bringing in new – really new – management to direct the restart and recovery efforts. New management is the fastest way to meaningful and lasting reforms. New managers can assess policies and practices unencumbered by “traditions.” New managers can stake out a new path with implicitly conceding it led troops down old paths. New management is a tried and true method for bringing about needed reforms in a timely manner. Yet it is an untried method at NRC, which desperately needs reform at any pace.

UCS is not advocating a massive infusion of new managers at NRC. This would be the fastest and surest way to the much-needed reforms, but it would be unfair to many fine public servants who have devoted many years of hard work on nuclear safety issues. Instead, we urge Congress to work with the NRC to revamp the agency's hiring and promotion policies. Retirements and other voluntary departures should provide opportunities for finding the most qualified replacements – not just the most qualified replacements from within the NRC. The salaries and benefits for NRC managers must be sufficient to attract and retain qualified candidates from inside and outside the agency.

NUCLEAR CROSSROADS

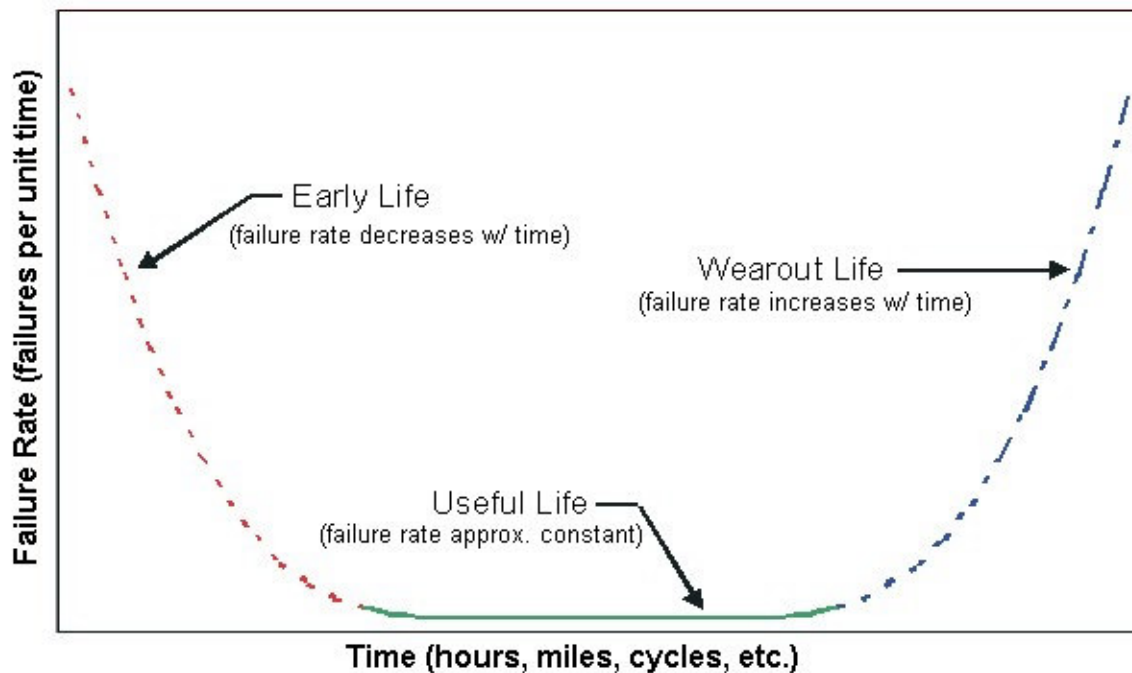
The future of nuclear power in the United States depends on decisions made now. The NRC's regulatory impairments make nuclear power's cost and risks higher than is necessary. Left unchecked, the only question is whether economics or disaster will bring down the curtain on nuclear power in America.

¹⁴ U.S. General Accounting Office, GAO/RCED-96-41, “Nuclear Regulation: Oversight of Quality Assurance at Nuclear Power Plants Needs Improvement,” January 1996.

Whatever role nuclear power plays in our energy future, the NRC must become an effective regulator. To hasten that transformation, the agency needs fresh perspectives from outside managers. One of the NRC's strengths is its work force of talented, capable, and dedicated employees. Properly led, they can make sure that nuclear power's costs are not too high or its safety levels too low.

The NRC is like NASA in that both agencies struggle with complex technologies where risk is dominated by low probability, high consequence events. We hope NRC is unlike NASA in not needing a tragic reminder to trigger the reform efforts that are so desperately needed.

The time for NRC to reform is running out. The Three Mile Island meltdown and other nuclear accidents at Chernobyl, Browns Ferry, St. Laurent, Fermi Unit 1, SL-1, and Sodium Reactor Experiment occurred in the first year or two of the plant's lifetime – during the break-in phase. As indicated in the figure of what is called the “bathtub curve” due to its distinctive shape, risk of failure is highest early and late in life. The 104 nuclear power reactors in the U.S. are heading towards, if not already within, the wear-out phase of life where risk once again rises. The NRC recurring, chronic problems must be fixed if the American public is to be adequately protected from the hazards of aging nuclear power plants.



On behalf of UCS, I wish to thank the Subcommittee for conducting this hearing on nuclear plant security and for considering our views on the matter.

Testimony of:

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